Chapter 4

Delivery of Fires

The POC is the C2 center for the Paladin howitzer platoon. Battery and platoon operations are similar in many ways to those in platoon-based M109A5 battalions. However, the primary focus of the Paladin POC is significantly different. Where the first priority of the M109A5 FDC is technical fire direction, the single most critical function of the M109A6 POC is database management.

POC RESPONSIBILITIES

4-1. Platoon-based operations and the ability of the Paladin to compute its own technical firing data have caused the traditional FDC to assume a broader role, performing tactical as well as technical fire direction. The Paladin POC's key responsibilities are:

- Perform database management.
- Provide survivability move criteria for the howitzers within the firing area and for tactical moves from one firing area to another.
- Perform tactical fire direction to ensure that the firing data is safe and does not violate maneuver boundaries, restrictive FSCMs, and intervening crests.
- Perform technical fire direction for special fire missions assigned by the battalion to the platoon.
- During some degraded operations, assume direct control of the technical fire direction and send firing data to the howitzers.
- Assume control of all six howitzers and act as the BOC if directed by the BC.

DATABASE MANAGEMENT

AFCS Input

4-2. During normal operations of the Paladin platoon, the on-board AFCS in each howitzer performs technical fire direction. After receipt of the initialization data (HOW;SBT, SPRT;MAP, MET;CM, AFU;REG) from the POC, the AFCS operator must input specific information regarding the howitzer. This information constitutes the database that the AFCS must continuously maintain if the Paladin is to be able to provide accurate predicted fires. The database information input at the AFCS includes current location, propellant temperature, load elevation and maximum tube elevation, site data, MVVs, and ammunition status.

AFCS/LCU Databases

4-3. Much of the data above is maintained in the nonvolatile memory of the AFCS, thus facilitating reinitialization following a normal shutdown. In case of a Paladin system failure, after the system is restored to operational status, the AFCS can and should request database information from the LCU. It is critical that database information is received, stored, updated, and maintained in the LCU at the POC as well as in the AFCS. Just as the AFCS can request database information from the LCU, the LCU operator can request the information from the AFCS for verification of the data the computer is maintaining for each individual howitzer. This duplicate database ensures that the Paladin can request accurate data to reinitialize quickly. Also, it allows the LCU to compute accurate firing data with the AFCS database, if required.

4-4. Whenever the AFCS or LCU resumes operations after a non-operational period, the LCU and the AFCS should exchange database information and conduct a verification mission to ensure consistency between the two elements. No matter how brief the shutdown period, the POC should assume that changes occurred.

Information Management Requirements

4-5. The capabilities of the on-board ballistic computer (AFCS) of the M109A6 generate a substantial increase in information management requirements for the POC. Each howitzer section has its own unique set of database information (such as location and AOF). The LCU database receives input from each howitzer AFCS. Likewise, the AFCS receives certain LCU information. Accurate and timely information management between systems is a must. Organization and training of the POC is necessary to properly manage database information.

Database Information

4-6. All database information should be readily available in the LCU. Obtaining this information from the LCU during fire mission processing may be inconvenient however. Therefore, a system of charts, checklists and overlays are necessary to show the FDO howitzer status, database information, and each howitzer's current location. Examples of status charts are as follows: POC LCU Checklist (Figure 4-1); Database Management Chart (Figure 4-2); and Example Platoon Ammunition Status Chart (Figures 4-3 and 4-4).

INITIALIZATION:		YES	NO
1. Load weapon-dependent program or restore database recording.			
2. SYSTEM SETUP	Verify initialization information.		
3. SYS;COMM	Verify communications characteristics.		
4. SYS;SBT	Verify subscriber table.		
5. HOW;SBT	Verify computer-generated entries.		
6. SPRT;MAP	Verify area of operations.		
7. AFU;UPDATE	Verify platoon data to be stored in the database.		
DATABASE:			
1. HOW;UPDATE	Verify Paladin locations and status.		
2. HOW;AMOUP	Verify ammunition status.		
3. AFU;MASK	Verify Paladin mask data.		
4. MET;CM	Verify meteorological data.		
5. FM;OBCO	Verify observer files.		
6. SPRT;GEOM	Verify support geometry.		
7. BCS;MVV	Verify MV data for the Paladins.		
8. AFU;REG	Verify registration file by charge and firing position.		
9. Conduct verification mission.			
OPERATIONS:			
1. Verify powder temperature at least every two hours.			
2. Verify target locations before transmitting fire missions to the Paladins.			
3. Measure and compensate for intervening crests.			
4. Control and verify positioning of Paladins during survivability moves.			
5. Transmit tactical information by use of the AFU;UPDATE message using the SYS;PTM to battalion.			

Figure 4-1. POC LCU Checklist

Max E:		Max N:						
Min E:		Min N:	Grid Zone:			Sphere:		
MAPMOD:						Datum:		
SYS:PTM Data:								
Move Order Grid:	Left Sector:	Center Sector:	Right Sector:	Max Elev	Load Elev	Powder Temp	Status	Remarks
1/1								
1/2								
1/3								
2/1								
2/2								
2/3								
Date Time Group (DTG) of Current Met Message:								
Other Information:								

Figure 4-2. Database Management Chart

PROJECTILE	BCS CODE	LOT	GUN #1	GUN #2	GUN #3	TOTAL
HE M107	HEA	A B				
RAP M549A1	HER	A B				
ICM M449A1	HEE	A B				
Illumination M485	ILA	A B				
DPICM M483A1	HEF	A B				
DPICM M864DB	HEF	A B				
ADAM Long M731	APL	A B				
ADAM Short	APS	A B				
Smoke M825	SMC	A B				
RAAMS Long M718A1	AML	A B				
RAAMS Short M741A1	AMS	A B				
Copperhead M712	CPH	A B				
OTHER		A B				

Figure 4-3. Example Platoon Ammunition Status Chart

PROPELLANTS	BCS CODE	LOT	GUN #1	GUN #2	GUN #3	EXTENDED LOT #	TOTAL
Charge 3-7 M4A2							
Charge 8 M119A1							
Charge 7(Red) M119A2							
Charge 8 Super M203							
Charge 8 Super M203A1							
FUZES							
Proximity M732	VTB						
Proximity M728	VTE						
MTSQ M564	TIA						
MTSQ M582	TID						
MTSQ M767	TIG						
PDSQ/D M557	PDA						
PDSQ/D M739	PDB						
Mech Time M565	TIF						
Mech Time M577	TIB						
Mech Time M762	TIH						
CP MK 399	PDE						

Figure 4-4. Example Platoon Ammunition Status Chart Continued

HOWITZER MOVEMENT AND LAND MANAGEMENT
Survivability Movement Control

4-7. One of the POC's key responsibilities is to control survivability movement of the howitzers within the firing area. The two methods the POC can use for this movement are centralized control and decentralized control.

4-8. **Centralized Control.** When using this method of control, the POC directly controls all howitzer movement. The POC designates the new location as a grid location, direction and distance, or quadrant. In the quadrant method a radius is drawn oriented to the AOF to facilitate the layout of quadrants (upper left-quadrant 1, lower left-quadrant 2, upper right-quadrant 3, and lower right-quadrant 4). The howitzers move on the specific order of the POC via a plain text message (PTM) or a voice command over the battery/platoon command net. Centralized control is best used under the following conditions: when deploying on limited terrain; when one or more howitzers have experienced system failures; when the commander wants to exercise maximum control; or the battery has inexperienced crews. This method of control increases the likelihood of accomplishment of supporting EFATs and allows the platoon leader and/or FDO to position assets based on the other friendly elements collocated in the platoon PA.

4-9. **Decentralized Control.** This method of control takes full advantage of the Paladin's capabilities. Each howitzer is deployed to its own assigned area of operation. Howitzer sections are allowed to move within the firing area at the discretion of the senior COS. Commander's guidance, the unit TSOP, the threat (for example, counterfire or ground attack), or METT-TC dictate movement of the howitzers (movement criteria). The disadvantages of this method are as follows:

- The POC must wait for the howitzer to arrive in its new position and report piece status (digital or voice) in order to post the howitzer location on the HTC.
- If there are problems with the new position (i.e., if it is too close to another Paladin's radius or friendly element), the POC must immediately initiate another move. Radii cannot overlap.
- The difficulty of coordinating platoon security is increased**.**
- The probability of two or more howitzers locating too close together or occupying a position recently vacated by another section is increased.

4-10. Whether centralized or decentralized, the platoon leader exercises the option of specifying a grid or a quadrant within the firing area radius or allows the platoon sergeants to move howitzers the minimum and maximum distances (METT-TC dependent).

Position Area Movement and the Howitzer Tracking Chart

4-11. Tracking the movement of three (and possibly as many as six) howitzers is a full-time job for one person in the POC. He must plot the locations on the HTC, post the current information on the database management chart, and provide a recommendation to the platoon leader and/or FDO regarding the proposed location for the howitzer's next move within the firing area.

4-12. The HTC is normally prepared on a piece of preprinted chart paper with each grid square representing 200 meters. The HTC is overlaid on a large-scale (normally 1:10,000) map and used to track the movement of the individual howitzers. It is prepared for each platoon PA and is used to manage the movement of the howitzers within the firing area and the PA so that they do not endanger themselves or other friendly elements.

4-13. **Plotting Procedure.** The HTC operator monitors howitzer movement on the tracking chart using color-coded tic marks. The upper right quadrant of the tic mark is labeled as follows: Platoon # Gun #. A black tic mark represents a howitzer's current location. A red tic mark represents the past location of the howitzer. A blue tic mark represents a howitzer's future location (used only during centralized operations). In decentralized operations, only black and red tick marks are used. When a new HOW;UPDATE message is received, the grid will be verified on the HTC and updated as necessary.

4-14. **Chart Use.** The platoon leader and/or FDO uses the HTC in one of two ways. If the platoon is operating under centralized control (Figure 4-5), the platoon leader/FDO looks at the chart and determines a new location that ensures mission accomplishment and will not endanger the howitzers or other friendly elements. He then directs movement via digital or voice radio. The message is given either as a new position grid, as a direction and distance for displacement, or by telling the senior COS which quadrant to go to.

4-15. If the platoon is operating under decentralized control, the platoon leader/FDO monitors the firing positions as reported by the sections as they occupy. He ensures that the howitzers remain within their assigned firing area and that they do not threaten friendly elements by positioning too closely to them. In the decentralized mode, the POC intercedes only if there is a problem. The platoon sergeants are normally in the best position to select positions based upon guidance received from the platoon leader.

4-16. Use of the HTC is mission and METT-TC dependent. For example, the HTC is very useful while fighting a deliberate defense. However, if conducting a movement to contact or a hasty attack it would be counterproductive to use the HTC until the platoon/battery has stopped and emplaced.
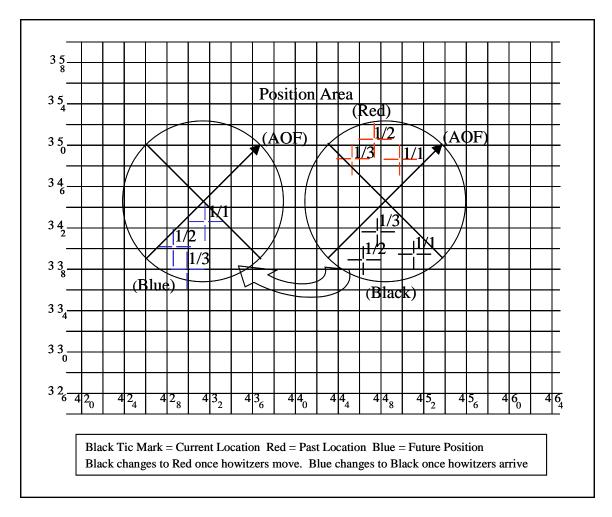
Figure 4-5. Example Howitzer Tracking Chart (Centralized Control)

TACTICAL AND TECHNICAL FIRE DIRECTION

4-17. The POC performs tactical/technical fire direction for fire missions assigned by the battalion to the platoon. This tactical fire direction includes howitzer selection for missions that do not require the entire platoon; for example, smoke, illumination, and precision registration missions. The FDO and FDC chief retain responsibility for tactical/technical fire direction while the platoon leader and his designated representative monitor the tactical situation. While tactical fire direction is primarily accomplished at the DS battalion CP, the POC should ensure that the fire orders received from the battalion are executed properly.

4-18. Technical fire direction during normal operations is accomplished by the AFCS at each individual howitzer. The leaders at the POC quickly review each mission as it is received to ensure that it is safe to fire and does not violate maneuver boundaries, restrictive FSCMs, or intervening crests. After these checks are conducted, the mission is transmitted to the howitzers for processing of individual firing data by the howitzer's on-board computer. This procedure may be modified to accommodate special circumstances. As an

example, precision registration missions are computed and controlled by the LCU at the POC.

DIRECT CONTROL BY THE POC

4-19. During some types of degraded howitzer operations, the POC may assume direct control of technical fire direction and send firing data to the howitzer as in a M109A5 unit. For example, if the AFCS of an individual howitzer section is degraded or inoperative, the POC may compute technical firing data for that section. (Note: The preferred method requires an operational howitzer to locate next to the degraded howitzer, and the degraded howitzer uses the operational howitzer's firing data.) Degraded operations TTP are discussed in detail in Appendix A.

4-20. In those cases when the POC is providing technical data down to one or more howitzers, secondary checks by independent means must be used. The secondary independent check for the LCU computing data for the degraded howitzer(s) will be by verifying howitzer location (i.e., GSG, platoon sergeant, platoon leader) and target location (i.e., fire support team, battalion FDC, POC). Once data is verified and correctly input into the LCU and no major database change has occurred, then data is good. Safety will be applied to the degraded howitzer the same as on operational howitzers.

POC CONTROL OF ALL BATTERY HOWITZERS

4-21. In addition to the functions listed above, each Paladin POC must be prepared to control all six of the battery's Paladins simultaneously. POCs must develop charts and procedures that let them C2 the entire battery. The battery commander may designate one of the POCs as the BOC. The functions of the BOC are outlined in FM 6-50, Chapter 1. To achieve mission requirements, the BC may augment the BOC with personnel from the battery headquarters.

Situation Map

4-22. The situation map is one of the most important tools in the POC to track operations. It should consist of the following overlays:

- Maneuver graphics for the force being supported. Friendly and enemy unit locations, FLOTs, and observer locations. (The battalion operations and intelligence (O&I) section should provide this information. The FDO must be proactive in ensuring that the information is current.)
- Platoon/battery operations overlay. This overlay includes the current PA of both platoons in the battery.
- Anticipated future PAs and the locations of the battery headquarters, the other battery POC, and the battery trains should also be posted. All of this information usually should not be posted on a single overlay. It may be necessary to use separate overlays, one for current and anticipated platoon PAs and one for battery trains and headquarters locations.
- Survey control information.

FIRE DIRECTION

4-23. The following paragraphs address those fire direction operational capabilities unique to the LCU and AFCS. Specific "how to" fire direction procedures are addressed in Appendix B.

HOWITZER STATUS REPORT

4-24. Each howitzer is managed as an individual firing unit and is, therefore, required to report its operational status in the same manner as the POC reports the status of the platoon to the battalion TOC. In reporting the howitzer's operational status, the following information is transmitted digitally to the POC:

- Specific location, AOF, maximum tube elevation, and powder temperature.
- Mask data.
- Ammunition on hand.
- MV information.

DATA TRANSMITTED TO HOWITZERS

4-25. The POC manually transmits the following via FM digital to each howitzer:

- Movement order.
- Ammunition information.
- MV information.
- Initialization data.
- Met data.

NOTE: The AFCS can digitally request all of the above information at any time. Howitzer subscriber information and met data cannot be requested from the howitzer.

Meteorological Data

4-26. When a computer met (MET;CM) is received at the POC from the battalion FDC or the meteorological measuring system (MMS), it is placed in the input queue of the LCU for operator review. Once validated, the message is executed. This process updates the met file as specified in the MET TO UPDATE field of the SYSTEM SETUP message. Once MET IN USE is updated, if AUTO XMIT DATABASE messages is NO, the MET;CM message is automatically generated and placed in the input queue for transmission to the Paladin. If AUTO XMIT DATABASE messages is YES the MET;CM message will be sent directly to the howitzer. This MET;CM message contains a total of 32 lines of met data. The first message contains lines 00 through 15, and the second contains lines 16 through 31. The met file is automatically updated after the AFCS has received both messages. The LCU operator must ensure that the message is acknowledged by all of the platoon's howitzers. Note: The met must have a "9" in the OCTANT field or the Paladin will not accept it. If both messages (pages) of the met are not acknowledged by the AFCS, the AFCS will not use the new met.

4-27. Once the met data are successfully updated in the POC and at the Paladin, previous met data must be deleted from the LCU database. Using the SYSTEM SETUP message, enter the previous MET IN USE value in the MET TO DELETE field and execute the message. No transmission to the Paladins is required.

AFCS CAPABILITIES

4-28. The AFCS has unique capabilities that give the POC great flexibility. These capabilities are discussed below.

- Each AFCS can store nine targets and one priority target. These targets may be planned targets, FPF, Copperhead priority targets, TOT missions, or any type of target deemed necessary by the POC.
- The priority mission buffer allows each howitzer to store one final protective fire (FPF) or one priority Copperhead mission. The POC designates priority missions.
- Each AFCS has a single active target buffer for mission processing.
- It is possible for the POC to link a TA asset or "sensor" with a single or multiple howitzers " shooter". (Note: There is a loss of tactical control by the POC when this is done.) The sensor may be a hand-held terminal unit (HTU), forward entry device (FED), a Firefinder radar (AN/TPQ-36 or Q-37), or the airborne target handover system (ATHS) aboard an OH-58D. For Copperhead missions, a single howitzer may be linked to the observer's HTU or FED. Additionally, the POC may allow a TA system the capability to access stored targets, adjust fires, and fire for effect (FFE) with a single howitzer. The "sensor-to-shooter" or "linked observer" mode is a special situation used only at the specific direction of the FSCOORD.

MISSION PROCESSING
CAPABILITIES AND RESPONSIBILITIES

4-29. The capabilities of the Paladin howitzer do not change the basic procedures for fire mission processing. However, they do change the location at which technical firing data are computed. Because the M109A6 has the capability to compute technical firing data, the POC assumes the role of providing tactical fire direction. After making whatever tactical fire direction decisions are necessary to meet the requirements, the POC transmits the fire order digitally to each howitzer for the computation of technical firing data. This is the normal method of processing calls for adjust fire and fire-for-effect missions. However, the POC is responsible for the computation of firing data for special missions.

REGISTRATIONS

4-30. The AFCS is capable of computing a ballistic solution, however, it cannot generate an AFU-REG message and the POC is not capable of requesting the AFU-REG. Therefore, all registrations (precision, radar, high-burst (HB), or mean point of impact (MPI)) are processed by the POC. When conducting a registration, the POC should direct the registering howitzer to emplace spades thereby minimizing displacement.

SPECIAL MISSIONS

4-31. The following special missions require specific input of data or unique handling by the POC before transmission to the howitzers:

- All illumination missions except one gun illumination.
- Destruction missions.
- SCATMINE.
- "Sensor-to-shooter" and emergency observer mission.
- Laser draw. Note: Laser draw is the procedure used to have aim points identified within an irregularly shaped target and transmitted to the LCU. The LCU then computes firing data to each aimpoint.

BATTALION UNIT OF FIRE

4-32. The unit of fire at battalion FDC is a three-gun platoon; however, it must be remembered that firing unit data at the battalion FDC reflects an average of three gun locations and azimuths of fire for all guns in a platoon.

ARTILLERY TECHNICAL REHEARSALS

4-33. FA technical rehearsals are critical to the success of the FA battalion. The technical rehearsal should include all elements in the FS chain down to the howitzer. The technical rehearsal allows the FA battalion to practice and verify the technical execution of EFATs. All elements in the chain must understand their EFATs and the commander's intent. For further explanation, refer to FM 6-20-1.

POC OCCUPATION PROCEDURES

4-34. Step 1: Find a suitable location (if not already done). Questions to ask are:

- Will I have good communication?
- Will I be concealed?
- Am I off high-speed avenues of approach?
- Is there an escape route?

Note: If the platoon is enroute to a position and the howitzers occupy, the POC should emplace and establish a firing capability. After the platoon is RTF, the POC can move as necessary to improve its location.

4-35. Step 2: Ensure voice and digital communications with battalion FDC and howitzers are established.

4-36. Step 3: Receive piece status (HOW;UPDATE) from howitzers and verify AOF.

4-37. Step 4: Verify database. If database information changes occur, the POC will direct a verification mission (i.e., check/change MVVs, registrations, ammunition, and met). At this time, the firing unit is RTF.

POC POST-OCCUPATION IMPROVEMENT

4-38. Once the occupation is completed and the unit is ready to answer calls for fire, sustaining actions begin. Refer to FM 6-50, Chapter 2 for post occupation sustaining actions.